

# Clinical, X-ray, and Serologic Changes With Histoplasma Infection

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ALTHOUGH considerable information about histoplasmosis has been accumulated since this fungus infection was first described in 1906, much still needs to be learned about the frequency and severity of the disease accompanying primary infection. Following the classic work of Smith and his colleagues on *Coccidioides* infection in personnel of the U. S. Army (1), it was decided that such personnel, with their available medical care and complete records, would be an ideal group for a study of histoplasmosis. Consequently, in 1953 a study was initiated at Fort Leavenworth, Kans., by the U. S. Army Hospital on the post and the Public Health Service. Children of Army personnel participated.

The study was undertaken to determine the spectrum of illness accompanying *Histoplasma* infection. This was accomplished by observation of the clinical, X-ray, and serologic changes which accompanied conversion of the skin test from negative to positive. Its basic plan was to find a large number of children

with a negative reaction to the histoplasmin skin test, observe these children over a period of time, and retest them to determine the infection, or conversion, rate. Clinical, X-ray, and serologic changes could thus be observed in a group who became infected and in a much larger group who did not and who therefore would serve as controls. Other interesting epidemiological information concerning infection was also collected.

## Material and Method

Fort Leavenworth, in northeastern Kansas about 30 miles from Kansas City, is the seat of the Command and General Staff College of the Army. The vast majority of the men stationed at this post are officer students of the school, arriving in August each year and departing the following June. These officers and their families have already had several years of Army life before coming to the post, including residence in all parts of the country and overseas. The children of these families formed the bulk of the children included in this study. Most of the remainder, but less than 10 percent of the total population tested, were children of the permanent personnel of the post living in the city of Leavenworth.

A preschool physical examination of all children is conducted routinely by the Army medical staff each August and September when the new families arrive on the post. In May of each year a smaller roundup is held for children who have arrived on the post or in the area later in the school year. These two examina-

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tion periods provided an opportunity for at least two tests of a large number of children, with a suitable observation period between.

For the histoplasmosis study, September 1953 through May 1955, skin tests with histoplasmin were given along with the routine tuberculin and Schick tests. All children present at the examination received the skin test. They ranged in age from 5 through 18 years.

In the fall of 1953 approximately 1,500 children were skin tested for histoplasmosis, and the following May those whose initial tests were negative were retested. Also in May, 50 more children were added to the study. In the fall of 1954 the 600 histoplasmin negative children who were still on the post from the previous year were retested, and 1,300 new arrivals received their first test. Those retested included the negatives among the 50 added in May, who were being retested for the first time, and continuously negative children, who were being retested a second time. The histoplasmin negatives among these 1,900 children were retested in May 1955. A total of 2,872 children were included in the study.

The histoplasmin used was lot HKC-5 diluted 2:1,000. This potency is equivalent to that of standard histoplasmin. The tests were all given intradermally in the right arm, and readings were made at 48 hours with measurement of the erythema and induration. An induration of 5 mm. or more at the 48-hour reading was considered a positive reaction. Children whose skin tests changed from negative to positive during the interval between the two examinations were converters. Those whose tests remained negative and those with positive reactions on the first test served as controls.

At the time of the two fall skin tests, blood was obtained for a serologic test on each alternate positive reactor to histoplasmin. When the negative reactors were retested, either in the spring or in the fall, blood specimens were obtained from all the children whose skin tests had changed from negative to positive and on the preceding and succeeding child in the examination line. The latter procedure provided controls, children whose skin tests remained negative, for the serologic testing.

**Table 1. Percentage of children positive to histoplasmin on initial test, according to age, Fort Leavenworth, Kans., 1953**

Age (years)	Number tested	Number positive	Percent positive
3-4	263	5	1.9
5-6	470	21	4.5
7-8	314	17	5.4
9-10	271	21	7.7
11-12	136	21	15.4
13-18	86	17	19.8
Total	1,540	102	6.6

Serologic tests were performed by Dr. Joseph Schubert of the Communicable Disease Center, Public Health Service, Chamblee, Ga., and by Dr. Samuel Salvin of the Rocky Mountain Laboratory, Public Health Service, Hamilton, Mont. Dr. Salvin performed a precipitin test using purified histoplasmin as the antigen and a complement fixation test using whole yeast phase organisms as the antigen. Dr. Schubert performed a complement fixation test using histoplasmin as the antigen. These tests were done without knowledge of the skin test status of the individual.

Depending on the size of the child, either an 11- by 14-inch or 14- by 17-inch chest X-ray was obtained for each at the time of the initial histoplasmin skin test. At the time of the retesting similar X-rays were taken of all children whose skin tests had changed from negative to positive and on some of the children selected for controls. At the same time second X-rays were taken on the initially positive reactors who had been serologically tested in the previous examination. All X-rays were interpreted by a qualified radiologist as well as by other physicians experienced in the interpretation of chest X-rays.

During the retesting, a questionnaire was given to the parents of each child. It asked about family visits of a day or more off the post, any illnesses which had occurred in the interval between tests, and other pertinent epidemiological factors. To supplement the questionnaire data, clinical records at the outpatient clinic and the post hospital were reviewed for pertinent illnesses during the interval. Illnesses associated with upper respiratory infec-

tion, bronchitis, pneumonia, and gastrointestinal disturbances were considered pertinent and were summarized on the child's record with respect to onset and duration. Clinic records were available for 2,375 of the children. They were not available for the remaining 497, including 2 converters, because of the transfer of the father.

### Basic Prevalence and Conversion Rates

In table 1 are shown the age-specific rates for histoplasmin sensitivity determined from tests of 1,540 children in September 1953. The overall prevalence is about 7 percent, with children

**Table 2. Age-specific conversion rates for histoplasmin skin test, Fort Leavenworth, Kans., 1953-55**

Age (years)	Number negatives retested	Number converters	Conversion rate	
			Observation period	Annual
Winter 1953-54				
3-6.....	534	12	2.2	3.3
7-10.....	429	24	5.6	8.4
11-18.....	143	7	4.9	7.4
Total.....	1,106	43	3.9	5.9
Summer 1954				
3-6.....	124	0	0	0
7-10.....	186	2	1.1	2.6
11-18.....	89	3	3.4	8.2
Total.....	399	5	1.3	3.1
Winter 1954-55				
3-6.....	464	7	1.5	2.3
7-10.....	476	5	1.1	1.7
11-18.....	217	8	3.7	5.6
Total.....	1,157	20	1.7	2.6
All periods combined				
3-6.....	1,122	19	1.7	2.5
7-10.....	1,091	31	3.0	4.5
11-18.....	449	18	4.4	6.7
Total.....	2,662	68	2.8	4.0

11 years and over showing much higher rates (average 17 percent). The percentage positive increases with age even though the geographic background of these children is varied. The prevalence of histoplasmin skin test sensitivity observed for the succeeding periods of study was similar to that for the first.

The age-specific conversion rates, shown in table 2, are based on the number of negatives that were retested at the end of each observation period and the number of children who had converted to a positive reaction during the period. Rates were calculated for the period of observation and then adjusted to a yearly rate. The total yearly rate for the first 8-month period (winter 1953-54) is about twice as high as that for either of the other two periods, and this seems attributable to an excessive rate of conversions among children aged 7-10 years during that particular period. The tendency for increasing rates of conversion with increasing age is apparent during all the periods. The 13- to 18-year-olds exhibit an annual rate of 11 percent compared with 3.6 percent for children aged 12 years or less.

Further analysis of the conversion rates is seen in table 3, which shows the rates of conversion among residents and among nonresidents of the post who returned questionnaires. Nearly all the nonresidents lived in the town of Leavenworth. The conversion rate for 144 nonresidents was 11.6 percent, whereas the rate for 2,101 residents was only 4.2 percent, one-third as high. These figures include all three observation groups. The annual conversion rates for the nonresidents were consistently higher in all 3 periods, running from 9 to 16 percent com-

**Table 3. Histoplasmin conversion rates among residents and nonresidents of the post, Fort Leavenworth, Kans., 1953-55**

Resident status	Number negatives retested	Number converters	Percent converters	Annual conversion rate
Nonresident.....	144	10	6.9	11.6
Resident.....	2,101	58	2.8	4.2
Total.....	2,245	68	3.0	4.8

<sup>1</sup> Total returning questionnaires.

**Table 4. Frequency of illness in relation to histoplasmin skin test status, Fort Leavenworth, Kans., 1953-55**

Histoplasmin skin test	Total number for whom clinical records were available	Type of illness						Total persons reporting illness	
		Upper respiratory		Bronchitis and pneumonia		Gastrointestinal			
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Negative.....	2, 140	1, 434	67	271	13	132	6	1, 837	86
Converter.....	66	38	58	7	11	4	6	49	74
Positive.....	169	107	63	6	4	10	6	123	73
Total.....	2, 375	1, 579	66	284	12	148	6	2, 009	85

pared with 2 to 6 percent for the nonresidents. Five of the ten nonresident converters were 11 years old or more, yielding a crude conversion rate of 21 percent compared with 4 percent for residents of the same age. For those under 11 years of age, the crude rate was 4 percent for

the nonresidents as opposed to 2.6 percent for residents.

**Changes Accompanying Infection**

Table 4 shows the prevalence of different types of illness among all the children for whom clinical records were available, including not only those who became infected (the converters) but those already infected (the positives) and those not infected (the negatives). The illnesses are classified as upper respiratory infection, bronchitis and pneumonia, and gastrointestinal infection.

Sixty-seven percent of the children who were histoplasmin negative had a clinical record of upper respiratory illness, while 58 percent of the converters and 63 percent of the positives reported such illnesses. For bronchitis and

**Table 5. X-ray results at the examination in September 1953, Fort Leavenworth, Kans.**

X-ray	Histoplasmin skin test			
	Number positive	Number negative	Total number	Percent positive
Negative.....	67	1, 416	1, 483	5
Lesion.....	12	10	22	55
Calcification.....	23	12	35	66
Total.....	102	1, 438	1, 540	7

**Table 6. X-ray results for children who had more than one X-ray, by histoplasmin skin test status, Fort Leavenworth, Kans., 1953-55**

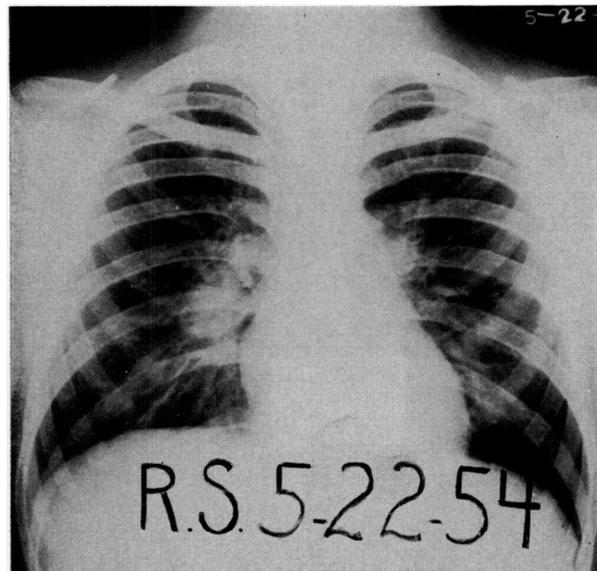
X-ray reading on initial test and retest films	Histoplasmin skin test						Total number
	Negative		Positive		Converter		
	Number	Percent	Number	Percent	Number	Percent	
Negative—negative.....	29	91	75	54	43	65	147
Negative—lesion.....	0	0	3	2	6	9	9
Lesion—lesion.....	1	3	10	7	3	5	14
Calcification—calcification.....	2	6	52	37	14	21	68
Total.....	32	100	140	100	<sup>1</sup> 66	100	238

<sup>1</sup> X-rays on 2 converters misfiled and not located.

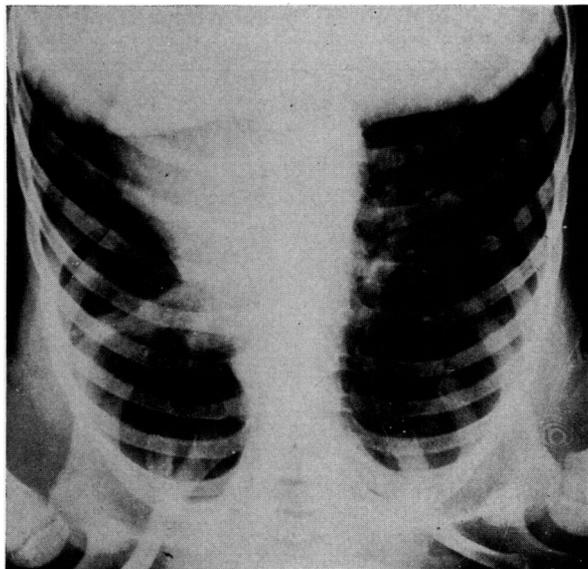
pneumonia the percentages were 13, 11, and 4, respectively. Thus there was no evidence of a greater frequency of respiratory illnesses among the converters than among either the continuously negative children or those previously infected. It is worth noting, however, that 58 percent of the converters had an upper respiratory illness and that 23 percent, or nearly half of these, had cases lasting 4 days or more.

The results of X-rays taken at the time of the original examination, in September 1953, are given in table 5. Among the children who had negative X-rays, 5 percent were histoplasmin positive. Among those who had lesions, 55 percent were histoplasmin positive, and among those who had calcification, 66 percent were positive to histoplasmin. Thus, frequent association of pulmonary calcification and lesions with positive histoplasmin skin tests is evident. Similar figures were observed for children admitted later to the study.

Table 6 shows the results of X-rays obtained on children who had X-rays both in the initial



**Figure 1.** R. S. W. M., age 10: Histoplasmin skin test and chest X-ray negative in September 1953. Histoplasmin skin test positive in May 1954. Chest X-ray May 22, 1954, revealed enlarged right hilar lymph node. Still present July 19, 1954. Three common colds from January to April 1954; bronchitis in November 1953. Serologic tests for histoplasmosis positive May 24, 1954.



**Figure 2.** W. S. W. M., age 4: Histoplasmin skin and chest X-ray negative in September 1954. In May 1955 histoplasmin skin test positive, 20-mm. induration. Only illnesses were tonsillitis in January 1955 and common cold in March 1955. X-ray taken May 23, 1955, showed pneumonic area in left mid-lung extending out from hilus. Area showed little clearing 3 days later. Serologic tests for histoplasmosis positive May 18, 1955.

examination and on a retest, including those who had X-rays taken because of conversion of the skin tests, the negatives chosen as serologic controls, and the initial positives who had received serologic tests. Of 238 children who had more than one X-ray, 147 were negative on both the initial and the retest X-ray. Fourteen had lesions on both films and 68 showed calcification on both films. The most important happening in this phase of the study was the development by 9 children of a lesion during the period between the 2 X-rays. Six of these nine were among 66 converters, and 3 were among 140 children whose skin tests were positive at the initial examination. Thus almost 10 percent of the converters developed a lesion compared with 2 percent of the initially positive reactors. Two of the lesions which developed among the converters are illustrated in figures 1 and 2.

Table 7 shows the results of serologic tests performed on 320 children in the study. Of

**Table 7. Serologic test results for histoplasmin reactor groups, Fort Leavenworth, Kans., 1953-55**

Histo- plasmin skin test	Serologic test				
	Num- ber posi- tive	Num- ber ques- tion- able	Num- ber nega- tive	Total num- ber	Per- cent posi- tive
Negative	3	2	109	114	2.6
Converter	13	9	40	62	21.0
Positive	10	14	120	144	6.9
Total	26	25	269	320	8.1

<sup>1</sup> 6 converters had no serologic tests.

these, 26, or 8 percent, had positive reactions.

Among the converters 21.0 percent had positive serologic tests, whereas among those remaining histoplasmin negative only 3, or 2.6 percent, had positive tests. Two of the latter three were low titer precipitin tests, a test for which some nonspecificity is known to exist. The remaining test was a minimal positive in the complement fixation test. Five converters had minimal positives in 1 of the 3 serology tests, 2 in the histoplasmin CF test and 3 in the yeast phase CF test. All the other converters yielded a higher response in one or more tests. Among the positive reactors in the first test, 6.9 percent had positive serologic tests.

Table 8 correlates the illness experience and the serologic and X-ray results among the converters. Of the 6 who developed a chest lesion

during observation, 4 had a positive serologic test and 3 had an illness. Among the 60 who did not develop chest lesions, 7 of the 33 who had illness also had a positive serologic test; only 2 of the 22 with no illness had a positive serologic test. Whenever both illness and chest lesions occurred, serologic tests were usually positive. Children not developing lesions did not show as high a prevalence of positive serologic tests as those who did.

### Epidemiology

As already noted in table 3 the conversion rate among residents of the post was about one-third that of nonresidents.

Table 9 shows a comparison of the histoplasmin conversion rate between individuals who visited off the post during the observation period and those who did not. A visit off the

**Table 9. Relation of histoplasmin conversion to off-post visits, Fort Leavenworth, Kans., 1953-55**

Visits	Histoplasmin skin test		
	Number of negatives retested	Number convert- ers	Percent convert- ers
No visits off post	1,303	33	2.5
Visits to farms	231	11	4.8
Other visits	567	14	2.5
Total	2,101	58	2.8

<sup>1</sup> 10 converters lived off post and were not included.

**Table 8. Illness experience and results of X-rays and serologic tests for histoplasmin converters, Fort Leavenworth, Kans., 1953-55**

X-ray	Illness			No illness			Total
	Positive serologic test	Negative serologic test <sup>1</sup>	No serologic test	Positive serologic test	Negative serologic test <sup>1</sup>	No serologic test	
Developed lesion	2	1	0	2	1	0	6
Did not develop lesion	7	26	2	2	20	3	60
No X-ray <sup>2</sup>	0	1	0	0	0	1	2
Total	9	28	2	4	21	4	68

<sup>1</sup> Questionable results are included with the negative serologic test.

<sup>2</sup> X-rays misfiled and could not be located.

**Table 10. History of pigeons on roof of house in relation to results of histoplasmin skin test, Fort Leavenworth, Kans., 1953-55**

History of pigeons	Number negatives retested	Number converters	Percent converters
Winter 1953-54			
Pigeons on roof .....	151	15	9.9
No pigeons on roof .....	783	22	2.8
Total .....	934	37	4.0
Summer 1954			
Pigeons on roof .....	86	1	1.2
No pigeons on roof .....	202	2	1.0
Total .....	288	3	1.0
Winter 1954-55			
Pigeons on roof .....	190	5	2.6
No pigeons on roof .....	669	12	1.8
Total .....	859	17	2.0
All periods combined			
Pigeons on roof .....	427	21	4.9
No pigeons on roof .....	1,654	36	2.2
Total .....	2,081	57	2.7

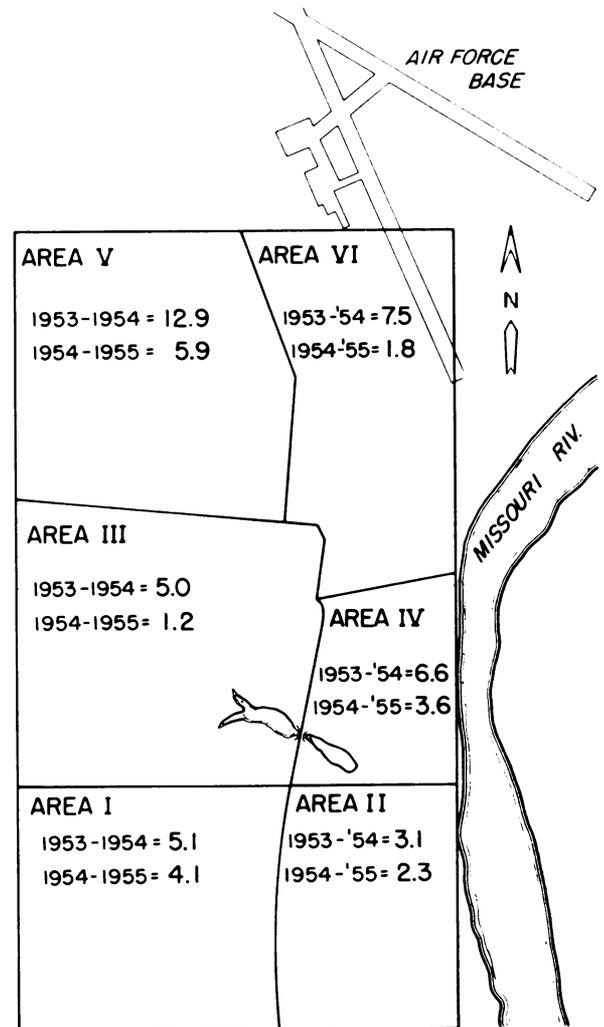
post to a farm was apparently a considerable factor in *Histoplasma* infection, doubling the rate of conversion of the skin test. This has been commented on previously (2). Visits to farms, however, do not explain all the infections which occurred since 47 of the 58 converters denied visiting a farm.

Since there was evidence of infection taking place on the post, further efforts were made to locate a possible source. It is a well-known fact that histoplasmosis is often incurred in old houses, belfries, and other places in which pigeons have been roosting. Since pigeons are plentiful in the old buildings at Fort Leavenworth, the relationship between pigeons roosting on the roof of the houses and histoplasmin conversion was considered. As shown in table 10, the histoplasmin conversion rate among those reporting pigeons on their houses

was more than twice that among the others on the post. This difference was most pronounced during the first observation period, the winter of 1953-54, when 10 percent of the children living in houses where pigeons roosted were histoplasmin positive, compared with 3 percent of those not so associated with pigeons.

Annual conversion rates for different areas of the post for the two winter periods are shown in figure 3. The distribution of converters is not at all uniform, area V showing the highest rates each year. These higher rates were not due solely to the concentration of pigeons men-

**Figure 3. Annual histoplasmin conversion rates for five residential areas at Fort Leavenworth, 1953-55.**



NOTE: Rates are adjusted to cover 12-month period.

tioned earlier because this concentration covered areas III and IV as well as V.

The extraordinary rate of histoplasmin conversion in area V led to additional investigation, which disclosed that 9 of the 12 converters during the first year lived in a large 3-story apartment house, the Beehive, which sheltered more than 50 families. These 9 converters came from a group of 97 children living in this house who were negative at the time of their first test in September 1953. Eight of the nine converters lived on the third floor, yielding a conversion rate of 27 percent for the children on this floor (table 11). The remaining converter lived on the first floor. In contrast, during the second winter observation period, only 4 of the 72 Beehive residents became histoplasmin positive, and only 1 of them lived on the third floor.

On further inquiry into the difference in conversion rates in the Beehive during the two periods, it was found that a sprinkler system had been installed in the attic of the building during the fall and early winter of 1953. The installation necessitated cutting holes for pipes through the attic floor and the ceilings and floors of the rooms below down to the basement. Furthermore, the attic had a number of broken windows, which permitted pigeons to enter and

nest in the attic. Large amounts of pigeon dung were found scattered throughout the attic, and holes had been bored through some of these areas. In addition, at the time the sprinkler system was installed it was necessary to remove a false floor in the attic, an operation which created a tremendous amount of dust and unquestionably stirred up the pigeon excreta which had been deposited on this false floor. Cultures from pigeon nests in the attic obtained a year or so later, however, showed no evidence of *Histoplasma capsulatum*.

### Discussion

The frequency of clinical illness among children converting from negative to positive on the histoplasmin skin test resembled superficially that observed in *Coccidioides* infection. The percentage of converters ill with upper respiratory infection, bronchopneumonia, or bronchitis of at least 4 days' duration was 30 percent in this study, compared with 24 percent with clinical illness in Smith's survey in Army camps (1). Sixty percent of those who became infected with *Coccidioides* and 42 percent of those who became infected with *Histoplasma* showed no upper respiratory illness. However, the incidence of illness among converters at Fort Leavenworth differed little from that of the control groups. Whether or not the same situation prevailed in the *Coccidioides* study cannot be determined because no studies on controls were done.

That *Coccidioides* infection is sometimes even less manifest than in Smith's report is indicated by the following quotation from a presentation at the Coccidioidomycosis Conference, Phoenix, Ariz., February 11-13, 1957, by Dr. Paul G. Hugenholz, formerly chief, Medical Service, Williams Air Force Base, Ariz.: "Forty-four converters to the coccidioidin skin test were observed among approximately 200 skin test negative recruits retested at 3-month intervals. Only 1 of these 44 is a clinically recognized case, and 5 other men had only a 'cold.' Indeed the illness was so vague that I would classify 43 of the 44 as 'inapparent infections.'"

The similarity in frequency of illness among the converters and the control groups consisting of previously infected children and those

**Table 11. Histoplasmin conversion rates according to floor of apartment house (Beehive), Fort Leavenworth, Kans., 1953-55**

Floor	Number negatives retested	Number converters	Percent converters
Winter 1953-54			
1st.....	37	1	3
2d.....	30	0	0
3d.....	30	8	27
Total.....	97	9	9
Winter 1954-55			
1st.....	27	3	11
2d.....	17	0	0
3d.....	28	1	4
Total.....	72	4	6

continuously negative at Fort Leavenworth is probably due to the infrequency of the *Histoplasma* infections (only 68 children among 2,662), compared with the frequency of other causes of illness; only 2.8 percent of the children became infected with *Histoplasma*, but 85 percent showed some type of illness. It may also be that *Histoplasma* infections in children are somewhat milder than infections in older people, which on the whole have been rather severe as seen in reports of epidemics of histoplasmosis. Perhaps dosage may be the important difference. It is important to note that both in the development of chest lesions and in the serologic tests a definite difference could be detected between the infected group and the control group. Certainly there is adequate evidence in the literature to substantiate the potential seriousness of both epidemic and sporadic histoplasmosis. One can only conclude that under the conditions of this study *Histoplasma* infections were not frequent enough or severe enough, or otherwise sufficiently different, so as to be distinguished from the other infections seen in the controls of similar age and with similar exposure.

The study indicates a direct relationship between the incidence of histoplasmin skin test conversions and residence off the post in Leavenworth and nearby Missouri and Kansas towns, visits to farms regardless of location, and association with pigeons. Conversion rates were especially high during the first year of the study among the top-floor residents of one large apartment house, where a sprinkler system was being installed. The remodeling required by installation of this equipment undoubtedly scattered pigeon dung deposited in the attic. The rates of infection were markedly lower the second year of the study, after the remodeling had been completed. Although *H. capsulatum* could not be demonstrated in material collected from the attic at a later date, the epidemiological data definitely point to dissemination of the infection from dry dust and pigeon manure stirred up by the remodeling.

Comparison of the prevalence of histoplasmin sensitivity among these Army children with that of natives of the area is interesting.

A previous study has shown that the rate among the natives is much higher; it is about 47 percent at ages 7-8 years, as compared with about 5 percent for the Army children of these ages. The difference is further brought out in table 3, which shows that nonresidents of the post (most of whom lived in Leavenworth) had a histoplasmin conversion rate three times higher than residents of the post. Also the rates of conversion are higher among the older children than among the younger ones (table 2). This may be associated with the fact that all the children, even those living on the post, attend high school in Leavenworth and are thus exposed to the factors which account for the high local rate.

### Summary

Clinical illness, development of chest lesions, and serologic changes accompanying infection with *Histoplasma capsulatum* were studied in children of United States Army personnel stationed at Fort Leavenworth, Kans. Of 2,662 with a negative reaction to the histoplasmin skin test on the first examination, 68 had a positive reaction to a second test 5 to 8 months later. Uninfected children, as well as those previously infected, served as controls for these converters.

Illness accompanying infection did not occur frequently enough to be separated from the routine upper respiratory illnesses occurring among the controls. This lack of definition may have been due to the infrequency of *Histoplasma* infections in these children (only 4 percent per year) in comparison with the frequency of upper respiratory infections (58 percent for the converters and 66 percent for the rest of the children in the study).

Chest lesions, evident on X-rays, developed more frequently among the converters than among the controls. Similarly, serologic tests were more often positive among the converters, and there was a definite relationship of serologic test results to illness and the development of chest lesions.

Epidemiological observations indicate that *Histoplasma* infections among these Army children resulted from several of various potentially infectious factors. These may be listed in the order of importance as living off the post,

visits to farms, living in a house frequented by pigeons, and, finally, living in a house where exposure to pigeon excreta unquestionably occurred.

#### REFERENCES

(1) Smith, C. E., Beard, R. R., Whiting, E. G., and Rosenberger, H. G.: Varieties of coccidioidal

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- (2) Furcolow, M. L., and Ney, P. E.: Epidemiological aspects of histoplasmosis. *Am. J. Hyg.* 65: 264-270, June 1957.
- (3) Furcolow, M. L., and Sitterley, J.: Further studies of the geography of histoplasmin sensitivity in Kansas and Missouri. *J. Kansas Med. Soc.* 52: 584-589, December 1951.

## publications

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### Public Sewage Treatment Plant Construction, 1956

*PHS Publication No. 549. 1957. 15 pages. 15 cents.*

Fifth in a series, this report gives the number and amount of contracts awarded for the construction of sewage treatment plants by municipalities in 1956. The awards are broken down by 15 major drainage basins of the United States, by population groups, and by size of contract. Place, type of construction, and cost of each contract are listed in the appendix.

The effects of the Federal grant program under Public Law 660 (84th Cong.) are not reflected since there has not been sufficient time to determine them.

### 20th Anniversary of the National Cancer Institute—Commemorative Symposium

*Journal of the National Cancer Institute, Vol. 19, August 1957. \$2.00*

Members of the staff of the National Cancer Institute, Public Health Service, have contributed special articles for this commemorative issue. Beginning with the text of the National Cancer Institute Act of August 5, 1937, they review the

development and accomplishments of cancer research and programs for cancer control.

Present and former members of the National Advisory Cancer Council, present Institute staff, and deceased staff members are listed in the appendix.

### A Comprehensive Program for Water Pollution Control for the Meramec River Basin

*Water Pollution Series No. 72. PHS Publication No. 553. 1957. 7 pages.*

One of a series presenting comprehensive pollution abatement programs developed by the States and adopted by the Surgeon General in accordance with the new Federal Water Pollution Control Act (P. L. 660, 84th Cong.), this publication summarizes the program developed by the Missouri Division of Health and the Public Health Service to control pollution in the Meramec River Drainage Basin (eastern Missouri).

The program provides an objective plan for citizens of the area and city officials and industrial leaders, farmers, fishermen, conservationists, and others. Projects (new plants, replacements, enlargements, additions) required to bring water pollution under control in the Meramec

River Basin are listed. Other recommendations relate to the operation of existing municipal and industrial waste treatment works, provision of adequate sanitary facilities and practices at camps and recreation centers, and control of new and increased sources of pollution.

### Barbiturates As Addicting Drugs

*PHS Publication No. 545. 1957. Folder. \$2.50 per 100.*

Prepared by the National Institute of Mental Health, Public Health Service, this folder points out the dangers of uncontrolled, habitual use of barbiturates. It describes the symptoms of barbiturate intoxication, how experiments have proved that addiction occurs, what kind of treatment is indicated, and why further research is needed.

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